CLAIMS

1.   A trick play method for achieving a trick play mode with a digital storage medium used to record and reproduce multimedia content including compression coded digital audio and video data, the digital storage medium recording

a directory segmenting the content into program units, further segmenting the content into a plurality of media object units, and recording each media object unit as a separate file,

a program manager file storing a table containing an identifier (ID) for each program of recorded content and information about the media objects in each program,

a media object information file storing a table containing playback time information and entry points at a specific time interval for each media object,

a playlist manager file containing playlist information including a user-specified playback start program ID and the specified playback start time and end time of said program;

said trick play method achieving a random access play mode by

detecting the playback time of media object information in a specified program sequentially from the beginning of the specified program when a user specifies a playback start program ID and playback start time within said program;

detecting media object k at the user-specified playback start time;

detecting the entry point at the user-specified playback start time by subtracting a total playback time to the immediately preceding media object from the user-specified playback start time, and comparing the

difference with a time search table resolution in the media object information for media object k;

reading and supplying to a decoder data for media object k from an entry frame of the media object data unit containing said entry point;

starting decoder output when decoding advances to the entry point; and

thereafter sequentially decoding media objects according to the playlist information and program manager file.

2.   A trick play method for achieving a trick play mode with a digital storage medium used to record and reproduce multimedia content including compression coded digital audio and video data, the digital storage medium recording

a directory segmenting the content into program units, further segmenting the content into a plurality of media object units, and recording each media object unit as a separate file,

a program manager file storing a table containing an identifier (ID) for each program of recorded content and information about the media objects in each program,

a media object information file storing a table containing playback time information and entry points at a specific time interval for each media object,

a playlist manager file containing playlist information including a user-specified playback start program ID and the specified playback start time and end time of said program;

a management data file containing a resume marker consisting of a program ID for a program where playback was last interrupted

and playback interrupt time where playback was interrupted in the program;

the trick play method achieving a fast-forward play mode when the user selects fast-forward play by:

reading the media object information in the program specified by the resume marker in sequence from the beginning;

sequentially comparing the playback time in the media object information with the interrupt time to detect media object k where the cumulative playback time first exceeds the interrupt time;

detecting the entry point identified by a number determined by calculating the difference of the interrupt time specified by the resume marker minus the total playback time to the immediately preceding media object, and dividing this difference by the time search table resolution in the media object information of media object k;

reading and supplying to the decoder entry frame data for the media object data unit corresponding to said entry point;

thereafter repeating the above steps to supply entry frame data for the next media object data unit to the decoder; and

rewriting the resume marker when fast-forward play ends with the program ID of the program at which playback is interrupted and the interrupt time in said program.

3.   A trick play method for achieving a trick play mode with a digital storage medium used to record and reproduce multimedia content including compression coded digital audio and video data, the digital storage medium recording

a directory segmenting the content into program units, further segmenting the content into a plurality of media object units, and recording each media object unit as a separate file,

a program manager file storing a table containing an identifier (ID) for each program of recorded content and information about the media objects in each program,

a media object information file storing a table containing 5 playback time information and entry points at a specific time interval for each media object,

a playlist manager file containing playlist information including a user-specified playback start program ID and the specified playback start time and end time of said program;

10 a management data file containing a resume marker consisting of a program ID for a program where playback was last interrupted and playback interrupt time where playback was interrupted in the program;

the trick play method achieving a fast-reverse play mode when the user selects fast-reverse play by:

15 reading the media object information in the program specified by the resume marker in sequence from the beginning;

sequentially comparing the playback time in the media object information with the interrupt time to detect media object k where the cumulative playback time first exceeds the interrupt time;

20 detecting the entry point identified by a number determined by calculating the difference of the interrupt time specified by the resume marker minus the total playback time to the immediately preceding media object, and dividing this difference by the time search table resolution in the media object information of media object k;

25 reading and supplying to the decoder entry frame data for the media object data unit corresponding to said entry point;

thereafter repeating the above steps to supply entry frame data for the preceding media object data unit to the decoder; and

rewriting the resume marker when fast-forward play ends with the program ID of the program at which playback is interrupted and the interrupt time in said program.

5   4.   A playback method for reproducing multimedia content from a digital storage medium starting from a playback start time, the digital storage medium recording multimedia content consisting of compression coded digital video data segmented into program units, each program unit segmented into media object units, and each media object unit segmented into media object

10   data units MODU of which the first frame is a reproducible entry frame; and

recording management information including a time search table defining a time search entry at each specific time interval ΔT from a beginning of each media object, a playback time for each media object, and a playback start time for a specified program,

15   the time search table containing an offset OF indicating a data length from a beginning of the specified program to a beginning of a media object data unit MODU containing the time search entry, and a frame count FN indicating a number of frames from the beginning of the media object data unit MODU to the time search entry;

20   the playback method reproducing content from the playback start time in a playback mode by means of:

steps (S3 to S6) for detecting the media object at the playback start time by sequentially subtracting the playback time of each media object from the playback start time starting from the first media object, and

25   comparing the resulting difference with the playback of the next media object;

steps (S7, S8) for detecting a time search entry closest before the playback start time and the remaining time from said time search entry to the playback start time using said resulting difference and the specific time

interval ΔT;

steps (S9, S10) for accessing to the data offset in the specified program based on the time search table of the detected time search entry;

steps (S9, S11) for decoding the frame count FN number of frames from the accessed point based on the time search table of the detected time search entry;

steps (S12, S13) for continuing decoding for the remaining time; and

steps for displaying the decoded result on screen after the remaining time passes.

5.	A playback method as described in claim 4, wherein the playback start time is a playback start time edited and specified by a user.

6.	A playback method as described in claim 4, wherein the playback start time is a playback start time specified by a resume marker containing time information indicating where playback was interrupted.

7.	A playback method for reproducing multimedia content from a digital storage medium starting from a playback start time, the digital storage medium recording multimedia content consisting of compression coded digital video data segmented into program units, each program unit segmented into media object units, and each media object unit segmented into media object data units MODU of which the first frame is a reproducible entry frame; and

recording management information including a time search table defining a time search entry at each specific time interval ΔT from a beginning of each media object, a playback time for each media object, and a playback start time in a specified program,

the time search table containing an offset OF indicating a data length from a beginning of the specified program to a beginning of a media object data unit MODU containing the time search entry, and a frame count FN indicating a number of frames from the beginning of the media object data unit MODU to the time search entry;

     the playback method reproducing content from near the playback start time in a fast-forward play mode by means of:

     steps (S3 to S6) for detecting the media object at the playback start time by sequentially subtracting the playback time of each media object from the playback start time starting from the first media object, and comparing the resulting difference with the playback of the next media object;

     steps (S7, S8) for detecting a time search entry closest before the playback start time using said resulting difference and the specific time interval ΔT;

     steps (S22) for accessing to the data offset in the specified program based on the time search table of the detected time search entry;

     steps (S23, S24) for decoding an entry frame at which playback can start at the accessed data offset position and displaying the decoded content;

     steps (S26) for detecting a next time search entry;

     steps (S22) for accessing to the data offset in the specified program based on the time search table of the detected time search entry; and

     steps (S23, S24) for decoding an entry frame at which playback can start at the accessed data offset position and displaying the decoded content.

8.   A playback method for reproducing multimedia content from a

digital storage medium starting from a playback start time, the digital storage medium recording multimedia content consisting of compression coded digital video data segmented into program units, each program unit segmented into media object units, and each media object unit segmented into media object

5   data units MODU of which the first frame is a reproducible entry frame; and

recording management information including a time search table defining a time search entry at each specific time interval ΔT from a beginning of each media object, a playback time for each media object, and a playback start time in a specified program,

10   the time search table containing an offset OF indicating a data length from a beginning of the specified program to a beginning of a media object data unit MODU containing the time search entry, and a frame count FN indicating a number of frames from the beginning of the media object data unit MODU to the time search entry;

15   the playback method reproducing content from near the playback start time in a fast-reverse play mode by means of:

steps (S3 to S6) for detecting the media object at the playback start time by sequentially subtracting the playback time of each media object from the playback start time starting from the first media object, and

20   comparing the resulting difference with the playback of the next media object;

steps (S7, S8) for detecting a time search entry closest before the playback start time using said resulting difference and the specific time interval ΔT;

steps (S22) for accessing to the data offset in the specified

25   program based on the time search table of the detected time search entry;

steps (S23, S24) for decoding an entry frame at which playback can start at the accessed data offset position and displaying the decoded content;

steps (S26) for detecting a previous time search entry;

steps (S22) for accessing to the data offset in the specified program based on the time search table of the detected time search entry; and

5   steps (S23, S24) for decoding an entry frame at which playback can start at the accessed data offset position and displaying the decoded content.

9.   A playback apparatus for reproducing multimedia content from a
10   digital storage medium starting from a playback start time, the digital storage medium recording multimedia content consisting of compression coded digital video data segmented into program units, each program unit segmented into media object units, and each media object unit segmented into media object data units MODU of which the first frame is a reproducible entry frame; and
15   recording management information including a time search table defining a time search entry at each specific time interval ΔT from a beginning of each media object, a playback time for each media object, and a playback start time for a specified program,

the time search table containing an offset OF
20   indicating a data length from a beginning of the specified program to a beginning of a media object data unit MODU containing the time search entry, and a frame count FN indicating a number of frames from the beginning of the media object data unit MODU to the time search entry;

the playback apparatus comprising:

25   means (S3 to S6) for detecting the media object at the playback start time by sequentially subtracting the playback time of each media object from the playback start time starting from the first media object, and comparing the resulting difference with the playback of the next media object;

means (S7, S8) for detecting a time search entry closest before the playback start time and the remaining time from said time search entry to the playback start time using said resulting difference and the specific time interval ΔT;

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means (S9, S10) for accessing to the data offset in the specified program based on the time search table of the detected time search entry;

means (S9, S11, S12, S13) for decoding the frame count FN number of frames from the accessed point based on the time search table of the detected time search entry and decoding the remaining time; and

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means for displaying the decoded result on screen after the remaining time passes.

10. A playback apparatus as described in claim 9, wherein the playback start time is a playback start time edited and specified by a user.

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11. A playback apparatus as described in claim 9, wherein the playback start time is a playback start time specified by a resume marker containing time information indicating where playback was interrupted.

20 12. A playback method for reproducing multimedia content from a digital storage medium in a fast-forward play mode starting from a playback start time, the digital storage medium recording multimedia content consisting of compression coded digital video data segmented into program units, each program unit segmented into media object units, and each media object unit

25 segmented into media object data units MODU of which the first frame is a reproducible entry frame; and

recording management information including a time search table defining a time search entry at each specific time interval ΔT

from a beginning of each media object, a playback time for each media object, and a playback start time in a specified program,

the time search table containing an offset OF indicating a data length from a beginning of the specified program to a beginning of a media object data unit MODU containing the time search entry, and a frame count FN indicating a number of frames from the beginning of the media object data unit MODU to the time search entry;

the playback apparatus comprising:

means (S3 to S6) for detecting the media object at the playback start time by sequentially subtracting the playback time of each media object from the playback start time starting from the first media object, and comparing the resulting difference with the playback of the next media object;

means (S7, S8) for detecting a time search entry closest before the playback start time using said resulting difference and the specific time interval ΔT;

means (S22) for accessing to the data offset in the specified program based on the time search table of the detected time search entry;

means (S23, S24) for decoding an entry frame at which playback can start at the accessed data offset position and displaying the decoded content; and

means (S26) for detecting a next time search entry.

13.   A playback method for reproducing multimedia content from a digital storage medium in a fast-reverse play mode starting from a playback start time, the digital storage medium recording multimedia content consisting of compression coded digital video data segmented into program units, each program unit segmented into media object units, and each media object unit segmented into media object data units MODU of which the first frame is a

reproducible entry frame; and

recording management information including a time search table defining a time search entry at each specific time interval ΔT from a beginning of each media object, a playback time for each media object,

5   and a playback start time in a specified program,

the time search table containing an offset OF indicating a data length from a beginning of the specified program to a beginning of a media object data unit MODU containing the time search entry, and a frame count FN indicating a number of frames from the beginning of the

10   media object data unit MODU to the time search entry;

the playback apparatus comprising:

means (S3 to S6) for detecting the media object at the playback start time by sequentially subtracting the playback time of each media object from the playback start time starting from the first media object, and

15   comparing the resulting difference with the playback of the next media object;

means (S7, S8) for detecting a time search entry closest before the playback start time using said resulting difference and the specific time interval ΔT;

means (S22) for accessing to the data offset in the specified

20   program based on the time search table of the detected time search entry;

means (S23, S24) for decoding an entry frame at which playback can start at the accessed data offset position and displaying the decoded content; and

means (S26) for detecting a previous time search entry.

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